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EXAMINER	
BRINEY III, WALTER F	

ART UNIT	PAPER NUMBER
2646	

DATE MAILED: 07/26/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/608,785	ENZNER, GERALD	
	Examiner	Art Unit	
	Walter F. Briney III	2646	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 February 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-9 and 11-22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9,11-14 and 17-22* is/are rejected.

7)☒ Claim(s) *15 and 16* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

1. **Claims 1-9, 11, 13, 14 and 17-22 are rejected under 35 U.S.C. 102(b) as being anticipated by Enzner et al. (European Trans. On Telecommunications, vol. 13, no. 2, pages 103-114, March-April 2002).**

Claim 1 is limited to *an echo cancellation system*. Enzner discloses a partitioned residual echo power estimation for frequency-domain acoustic echo cancellation and post filtering (see Abstract). The basic components comprising this invention are depicted in figure 2. As with any acoustic echo canceller placed in a speakerphone, the system includes *a microphone* that receives noise, speech, and echo. It also includes a controlling block (not shown) that is responsible for updating both the adaptive acoustic filter and residual echo filter. The residual echo filter operates in the frequency domain, as indicated in the second introductory paragraph as and equation 14. As indicated in the fourth paragraph of the introduction, the residual echo filter (i.e. *post-filter*) and the echo canceller (i.e. *echo canceller module*) both receive control signals generated from a common algorithm, in particular, an unbiased residual echo PSD estimator algorithm. The residual echo filter receives the total residual echo PSD (i.e. *a second control signal*) while the echo canceller receives a partial residual echo PSD (i.e. *a first control signal*). Therefore, Enzner anticipates all limitations of the claim.

Claim 2 is limited to *the echo cancellation system of claim 1*, as covered by Enzner. The partial residual echo PSD estimate generated by equation 24 of Enzner corresponds to a step-size signal as it modifies the gradient change of the echo canceller. See equations 9 and 13 on page 105. Equation 9, in particular, corresponds to the predetermined criterion by which the gradient change is provided to the echo canceller. Therefore, Enzner anticipates all limitations of the claim.

Claim 3 is limited to *the echo cancellation system of claim 1*, as covered by Enzner. Equation 15 of page 105 illustrates the usage of the full residual echo PSD estimate Φ_{BB}. In particular, it is used, albeit in conjunction with other factors, to weight the error signal according to equation 14. In this way, the residual echo PSD estimate (i.e. *second control signal*) corresponds to *a further transfer function signal of the post-filter*. Therefore, Enzner anticipates all limitations of the claim.

Claim 4 is limited to *the echo cancellation system of claim 1*, as covered by Enzner. Figure 2 illustrates the two algorithm blocks of the echo reduction system, in particular, the residual echo and noise reduction algorithm, which corresponds to the *post-filter* as recited. As seen from the figure, the residual echo reduction algorithm is responsive to the *echo-reduced microphone signal* $E(\Omega)$ and the *second control signal* $\Phi_{BB}(\Omega)$. Therefore, Enzner anticipates all limitations of the claim.

Claim 5 is limited to *the echo cancellation system of claim 1*, as covered by Enzner. Figure 2 depicts the *echo canceller's* responsiveness to the *voice signal* and *echo-reduced microphone signal*. Equation 13 indicates the *echo canceller's* responsiveness to the first control signal $\Phi^{(\lambda)}{}_{BB}(\Omega)$. Equation 11 and figure 2 indicate

the *echo canceller's* ability to respond to the above signals to generate an *estimated echo signal* (D_hat(Ω) that is provided to an adder. Therefore, Enzner anticipates all limitations of the claim.

Claim 6 is limited to *the echo cancellation system of claim 5*, as covered by Enzner. Figure 2 and equation 11 indicate that the *echo canceller* generates the *estimated echo signal* in response *the voice signal* ($X^{(\lambda)}(\Omega)$) and a *transfer function* ($W^{(\lambda)}$). Therefore, Enzner anticipates all limitations of the claim.

Claim 7 is limited to *the echo cancellation system of claim 5*, as covered by Enzner. Equation 9 depicts a *gradient adaptation means* for generating *an echo transfer function* ($W^{(\lambda)}$) in response to both the *voice* and the *first control signals*. Therefore, Enzner anticipates all limitations of the claim.

Claim 8 is limited to *the echo cancellation system of claim 5*, as covered by Enzner. Equations 14 and 15 indicate that the post-filter applies function (H_W) to the *echo-reduced microphone signal* (E), where (H_W) is a function of the *second control signal* (Φ_{BB}). Therefore, Enzner anticipates all limitations of the claim.

Claim 9 is limited to *the echo cancellation system of claim 1*, as covered by Enzner. Figure 2 and equation 11 indicate the presence of an *adder* that generates an *echo-reduced microphone signal* in response to an *echo estimate* (D_hat(Ω)) and a *microphone signal* (Y(Ω)). Therefore, Enzner anticipates all limitations of the claim.

Claim 11 is limited to *the echo cancellation system of claim 1*, as covered by Enzner. The filters disclosed by Enzner are based in the frequency domain. See section 2.3, in particular the last paragraph (i.e. *wherein the statistical adaptive-filter*

controller, the echo canceller module, and the post-filter operate in a frequency domain). Hence, it follows that the first and second control signals used for updating the filters are also in the frequency domain (i.e. *and said first and second control signals are provided in the frequency domain as well*). Therefore, Enzner anticipates all limitations of the claim.

Claim 13 is limited to *the echo cancellation system of claim 12*, as covered by Enzner. Enzner discloses that the analysis functions operate in the DFT domain (i.e. *wherein the frequency domain is implemented as a Discrete Fourier Transform (DFT) domain*). See section 2.3, in particular the last paragraph. Therefore, Enzner anticipates all limitations of the claim.

Claim 14 is limited to *the echo cancellation system of claim 13*, as covered by Enzner. Enzner discloses calculating the total and partial residual echo PSD estimates (i.e. *the second and first control signals*, respectively) according to equations 24 and 25. Equation 24 includes the coherence function $C_X{}^{(\lambda)}{}_E$ that is described in equation 20, where equation 20 comprises the PSD of both the echo causing signal (i.e. *voice signal*) and the error signal (i.e. *echo-reduced signal*). Therefore, Enzner anticipates all limitations of the claim.

Claims 17-22 are methods whose steps are inherently performed by the various systems recited in claims 1, 2, 3, 6, and 8. Therefore, claims 17-22 are rejected for the same reasons.

2. Claims 1 and 12 are rejected under 35 U.S.C. 102(b) as being anticipated by Capman et al. (US Patent 6,108,413).

Claim 1 is limited to *an echo cancellation system*. Capman discloses an echo cancellation method and echo canceller implementing such a process. See Abstract. The embodiment of figure 6 includes a generalized echo transfer system (1), for example, an acoustic echo transfer system. See figure 1. The acoustic echo transfer system includes a microphone (4) responsive to voice, noise and echo produced by a loudspeaker (3) responsive to voice (x(n)). As the microphone responds in an unbiased manner to each input signal, it produces an *echo signal* as a component of a total *microphone signal*. Figure 6 depicts a coherence calculation unit (32) and filter (33) that correspond to the statistical adaptive-filter controller as recited. In particular, the coherence calculator aspect responds to the voice signal (x(n)) proceeding modification by the adaptive filter (7) as well as an echo reduced microphone signal (z(n)) that contains an echo component reduced by the transfer function of the channel (1). The coherence calculator aspect generates a *second control signal* for a post-filter (34) while the filter aspect (33) generates a first control signal for use by the adaptation controller of the echo canceller. Figures 7 and 8 clearly depict the overlap in the algorithm used in generating the first and second control signals. Each requires the values $msc_p(1)$-$msc_p(M)$, and while these values are enough to be considered *a second control signal* for the *post-filter*, they are further processed by the filter aspect (33) to generate the time-domain control signal e1(n), which corresponds to *the first control signal*. The generation of $msc_p(1)$-$msc_p(M)$ corresponds to the *common algorithm*. Therefore, Capman anticipates all limitations of the claim.

Claim 12 is limited to *the echo cancellation system of claim 1*, as covered by Capman. The *second control signal* values mscp(1)-mscp(M) are clearly *frequency-domain* coefficients as evidenced by the FFT block (38) and IFFT block (63) of figures 7 and 8, respectively. The first control signal e1(n) is a time-domain signal as indicated by the IFFT block (58) of figure 8, and as such, indicates that the echo canceller adaptation controller (9) and the echo canceller filter (7) of figure 6 operate in the time-domain. Therefore, Capman anticipates all limitations of the claim.

Allowable Subject Matter

The following is a statement of reasons for the indication of allowable subject matter:

3. **Claims 15 and 16 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.**

Claim 15 is limited to *the echo cancellation system of claim 14*, as covered by Enzner. As clearly indicated in the applicant's specification, the current application differs from the Enzner reference by eliminating the step of calculating the residual echo for the purpose of generating the step size of the adaptive echo canceller. See page 9, first paragraph and equation 3. Therefore, Enzner anticipates all limitations of the claim with the exception *wherein said step-size signal is determined according to:*

$\mu(k) = |G'|^2 \, \Phi_{xx}(k) / \Phi_{ee}(k)$,

wherein $|G'|^2$ *is a predetermined constant and* $\Phi_{xx}(k)$ *and* $\Phi_{ee}(k)$ *denote the first and second power spectral density signals, respectively, and k is a frame time index.*

Furthermore, none of the cited prior art anticipates nor suggests replacing the approximated residual echo with a predetermined constant. The argument pertaining to removal of an element or step and its function also fails to make up for the prior art's deficiencies. In particular, removal of a step, i.e. calculating the residual echo G(k), while maintaining its effect is proof of non-obviousness. Therefore, claim 15 is allowable over the cited prior art.

Claim 16 is dependent on claim 15 and is allowable over the cited prior art for the same reasons.

Response to Arguments

Applicant's arguments filed 07 February 2005 concerning claims 1-14 and 17-22 are moot in view of new grounds of rejection. However, because the Enzner reference is now being properly applied under U.S.C. 35 §102(b), the arguments concerning claims 1, 11, 13 and 14 are addressed herein.

With respect to claim 1, the applicant alleges on pages 11 and 12 of the current response that Enzner does not describe a statistical controller which provides joint control of an echo canceller module and a post-filter by generating first and second control signals using an optimized common algorithm as recited; the examiner respectfully disagrees. In contrast to the applicant's assertion that there is no explicit or inherent disclosure of joint control, Enzner clearly states in the second paragraph of the introduction, "[a] true synergy of acoustic echo cancellation and post-filtering can be obtained if both algorithms are implemented in the frequency domain. That leads to the

concept of joint control...based on residual echo estimation." Enzner further states in the fourth introductory paragraph, "*we propose a new unbiased residual echo PSD estimator...[t]he total residual echo PSD is then utilized to determine the optimum spectral weights for joint residual echo and background noise suppression, while the individual contributions can be used to control individual sections of a partitioned frequency domain adaptive filter.*" The second selection above indicates that the adaptive filter and residual echo filter receive control signals generated from a same algorithm, in particular a residual echo PSD estimator algorithm. As all of the applicant's arguments have been shown to be either moot or unpersuasive the rejection of claim 1 is maintained.

With respect to claims 11, 13 and 14, the applicant alleges on page 12 of the current response that these claims are allowable based on their dependence from claim 1; the examiner respectfully disagrees in light of the arguments made in support of maintaining the rejection of claim 1 supra. As all of the applicant's arguments have been shown to be either moot or unpersuasive the rejection of claims 11, 13 and 14 are maintained.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Walter F. Briney III whose telephone number is 571-272-7513. The examiner can normally be reached on M-F 8am - 4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sinh Tran can be reached on 571-272-7564. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

WFB
7/21/05

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SUPERVISORY PATENT EXAMINER